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SNAP BEANS—I. THE INFLUENCE OF PLANTING DATES ON DRY BEAN YIELD OF BUSH AND POLE SNAP BEAN VARIETIES [1]

ANDRES F. CELESTINO and JOSE R. DEANON, JR.

In both the cool and hot season test, Wade, Contender, and Improved Tendergreen were the most outstanding yielders among the bush varieties of snap beans; Tropic Wonder and Kentucky Wonder were the best yielders among the pole varieties.

The varieties within each of the bush and pole groups performed differently in the two planting dates. In general, however, all the varieties yielded better when they were grown in November than in February.

Significant differences were obtained between some of the varieties within each group with respect to length of pod, number of seeds per pod and weight of 20 seeds. These agronomic characters were not directly related to yield

Seeds of snap beans are relatively inexpensive and highly nutritious, being rich in protein, phosphorus, calcium, iron, and in food energy (Watt *et al.*, 1950). Moreover, they can be preserved for a long time and can be used all the year round.

Snap beans were previously considered as requiring cool, elevated places like Baguio until Cadiz *et al.* (1958) found from their extensive variety evaluation experiments that many varieties can be grown practically everywhere. Zaumeyer (1954), however, stated that bean varieties differ greatly in their response to weather conditions. Several varieties were tested at various places, from Cotabato in the south to Ilocos Norte in the north at elevations ranging from 20 to 7000 feet above sea level.

While the adaptation of snap beans to various soil and climatic conditions has been sufficiently studied, their seed producing capacity and their proper time of planting have not yet been properly evaluated.

This study was conducted to evaluate the seeding ability of the adapted varieties and to determine the best time for planting them

[1] Central Experiment Station Contribution No. 2018. Part of research project No. 1069.

under local conditions from November, 1958 to May, 1959 at the Vegetable Crops Section, Department of Agronomy, U.P. College of Agriculture.

MATERIALS AND METHODS

Six varieties of bush and five of pole snap beans were grown in 2 sets, one in the cooler part of the year (planted on November 2, 1958) and the other in the hotter part of the year (on February 5, 1959).

A randomized block design with three replications was used.

Six-meter row plots with furrows one meter apart laid out with a native plow were used. Three seeds were planted in hills 30 centimeters apart in the row.

All the varieties were equally fertilized with 60 kilograms of phosphorus and potassium, and 45 kilograms of nitrogen per hectare. Nitrogen was applied as ammonium sulfate (20 per cent N), phosphorus as ordinary superphosphate (20 per cent P_2O_5), and potassium as muriate of potash (60 per cent K_2O). The fertilizers were mixed, applied in band at the bottom of the furrow and covered with about an inch of soil before planting. After two weeks, the plants were side-dressed with another 45 kilograms of nitrogen per hectare. A total of 90 kilograms of nitrogen per hectare was applied.

The pods were harvested as they matured. The seeds were threshed and dried in an oven for 48 hours at 43°C. Then, the seed yields were calculated based on a computed seed moisture content of 11 per cent.

The average monthly temperature during the time of the experiment, as reported by the College of Agriculture Weather Station at College, Laguna, gradually rose from 26.0°C. in November, 1958 to 29.2°C. in May, 1959. The rainfall during the same period was low and unevenly distributed. Irrigation water was applied during the periods of low precipitation.

RESULTS AND DISCUSSION

Experiments on bush snap beans

Seed yield. Analysis of the results obtained in the first experiment in this series showed that Wade significantly outyielded all the

other varieties except Improved Tendergreen. The yield differences between Improved Tendergreen and the rest of the varieties were not marked, except Stringless Green Pod which yielded significantly lower than some of the varieties (table 1).

TABLE 1.—*Dry bean yield (in grams per 6 sq. m. at 11 per cent moisture) of different varieties of bush snap beans*

VARIETY	NOVEMBER PLANTING		FEBRUARY PLANTING	
	Total	Mean	Total	Mean
Stringless Green Pod	705	235.0	405	135.00
Contender	1450	483.3	752	250.67
Processor	1014	338.0	544	181.33
Wade	1970	656.7	1013	337.67
Tender Pod	1442	480.7	428	142.67
Improved Tendergreen	1525	508.3	679	226.33
HSD 5%		160.12		72.96
1%		209.68		95.55

In experiment 2, Wade significantly exceeded the rest of the varieties (table 1). Contender and Improved Tendergreen were significantly better than the other varieties except Processor. Stringless Green Pod had the lowest yield.

Variety and planting date interaction. An analysis to determine the performance of the varieties in the 2 tests was made. The variety and planting date interaction was significant. This indicates that the varieties responded differently in the 2 dates of planting. Contender outyielded Improved Tendergreen in the February test. Similar results were obtained for Tender Pod and Processor. Mimms and Zaumeyer (1947) and Zaumeyer (1954) stated that bean varieties differ markedly in their responses to weather conditions.

All the varieties performed remarkedly better when planted in the cool, dry month of November rather than in the hot, dry month of February. The prevalently high temperature occurring during the growth of the plants, especially at blooming time, appeared to be responsible for the low yield. Minges and Harrington (1954) and Andersen (1955) stated that although snap beans have a wide range of climatic adaptation, they do not grow well where temperature go extremely high. Hot weather at blossom time can lower yield of beans considerably due to blossom drop and poor seed set.

Other agronomic characters. Length of pod, number of seeds per pod, and weight of 20 seeds were noted in the first experiment. These

characters were correlated with yield to find out whether such qualities can be used as an index of the yielding ability of beans.

Contender gave significantly longer pods than the other varieties while Tender Pod had the shortest pod (table 2). Improved Tendergreen, Wade, Processor, and Stringless Green Pod did not vary markedly from each other. Length of pod was not directly related to yield.

TABLE 2.—*Summary table for other agronomic characters of bush snap beans: average length of pod, number of seeds per pod, and weight of 20 seeds* [a]

VARIETY		LENGTH OF POD [b]	NUMBER OF SEEDS PER POD [b]	WEIGHT OF SEEDS [c]
Stringless Green Pod		9.44	4.45	7.80
Contender		11.23	4.42	8.07
Processor		9.94	4.43	513
Wade		9.88	4.83	7.47
Tender Pod		7.66	4.35	5.90
Improved Tendergreen		10.39	5.35	6.93
H.S.D.	5%	1.34	n.s.	1.26
	1%	1.71	n.s.	1.66

[a] Taken from experiment 1.
[b] Based on 20 pods.
[c] Based on 11 per cent seed moisture.
n.s.—Not significant.

There were no marked differences in the average number of seed per pod between any of the varieties (table 2). Improved Tendergreen and Tender Pod has the greatest and least number of seeds per pod, respectively.

The seeds of Contender, Stringless Green Pod, and Wade were significantly heavier than those of Tender Pod and Processor. Likewise, Improved Tendergreen significantly exceeded Processor which had the lightest weight of seed (table 2). Weight of seed was not related to yield.

Experiments on pole snap beans

Seed yield. In the first experiment, Tropic Wonder significantly outyielded the rest of the varieties (table 3). The difference between the mean yields of Kentucky Wonder and Kentucky Wonder 191 was highly significant. Kentucky Wonder 191 in turn gave a yield sig-

nificantly better (even at the 1 per cent level) than the yields of Blue Lake Black Seeded and Stringless Blue Lake.

TABLE 3.—*Dry bean yield (in grams per 6 sq. m. at 11 per cent moisture) of different varieties of pole snap beans*

VARIETY	NOVEMBER PLANTING		FEBRUARY PLANTING	
	Total	Mean	Total	Mean
Kentucky Wonder	2559	853.0	1686	562.0
Kentucky Wonder 191	1565	521.7	1148	382.7
Stringless Blue Lake	1134	378.0	1013	337.7
Blue Lake Black Seeded	1138	379.3	1103	367.7
Tropic Wonder	2779	926.3	1676	558.7
HSD 5%		66.31		131.15
1%		89.90		177.15

In experiment 2, Kentucky Wonder appeared to yield more than Tropic Wonder, but their difference was not significant. On the other hand, they yielded significantly better than the other varieties (table 3). Kentucky Wonder 191 in turn gave significantly better yield than Blue Lake, Black Seeded, and Stringless Blue Lake. The latter two varieties did not differ in yield.

Variety and planting date interaction. As in the experiment on bush snap beans, a significant variety-and-planting-date interaction was obtained. Some of the varieties which yielded high in November were outyielded by other varieties in February.

Planting dates had a distinct influence on the seeding performance of the different varieties. The beans planted in February yielded definitely less than those planted in November. The cool temperatures that generally prevailed during the most active growth stage until blooming time, seemingly have contributed to the better yield. Cox and Montelaro (1952) concluded that snap beans grew well under fairly cool weather.

Other agronomic characters. For the same reason mentioned under bush bean experiments, data on length of pod, average number of seeds per pod, and weight of 20 seeds were gathered from experiment 1 and these characters were correlated with yield.

Kentucky Wonder 191, Tropic Wonder, and Kentucky Wonder did not differ significantly from each other; all had significantly

longer pods than Blue Lake Black Seeded and Stringless Blue Lake (table 4).

The differences in the average number of seeds per pod between some of the varieties were significant. Kentucky Wonder and Tropic Wonder had remarkably more seeds per pod than the other varieties except Blue Lake Black Seeded (table 4). No significant differences were obtained between Blue Lake Black Seeded and the rest of the varieties.

TABLE 4.—*Summary table for other agronomic characters of pole snap beans: average length of pod, number of seeds per pod and weight of 20 seeds* [a]

VARIETY		LENGTH OF POD [b]	NUMBER OF SEEDS PER POD [b]	WEIGHT OF SEEDS [c]
Kentucky Wonder		16.45	7.38	7.20
Kentucky Wonder 191		16.62	6.13	7.73
Stringless Blue Lake		12.48	5.93	5.57
Blue Lake Black Seeded		12.18	6.68	5.63
Tropic Wonder		16.50	7.00	6.70
H.S.D.	5%	1.42	0.83	0.65
	1%	1.92	1.13	0.86

[a] Taken from experiment 1.
[b] Based on 20 pods.
[c] Based on 11 per cent seed moisture.

Very marked differences in seed weight were noted between Kentucky Wonder 191 and the other varieties (table 4). Tropic Wonder and Kentucky Wonder, the high yielding varieties, did not differ; also the low yielding varieties, Blue Lake Black Seeded and Stringless Blue Lake.

Length of pod, number of seed per pod and weight of 20 seeds were not directly related to yield.

CONCLUSION

1. Of the bush varieties, Wade was the most outstanding; it consistently gave the best yield in both tests. Improved Tendergreen and Contender also proved superior, being better than the other varieties.

2. Tropic Wonder and Kentucky Wonder yielded significantly better than the other pole varieties under both tests. In the first experiment during the cooler part of the year, Tropic Wonder signifi-

cantly outyielded Kentucky Wonder at 5 per cent level. During the hotter part of the year Kentucky Wonder tended to yield more than Tropic Wonder, but their difference was not significant.

3. All varieties within each of the bush and pole type groups differed greatly in their performance in both tests. Some of the varieties which yielded high in November were outyielded by the other varieties in February. In general, all the varieties performed better when they were grown in November. The cool temperature that prevailed throughout the growth of the plants seemed to have been responsible for this good yield of dry beans.

4. Significant differences in length of pod, weight of 20 seeds and number of seeds per pod were obtained between some of the varieties within each of the bush and pole type groups. These agronomic characters were not directly related to yield.

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BIOLOGICAL TEST OF FUNGICIDAL SPRAY STICKERS ON THE CONTROL OF CERCOSPORA LEAF SPOT OF TOBACCO [1]

R. G. DAVIDE and F. T. ORILLO [2]

WITH ONE TEXT FIGURE

All the sticker-fungicide treatments on tobacco remarkably increased spray retention and afforded a longer period of protection against *Cercospora nicotianae* Ell. & Everh. At 4-liter artificial rain applications, Orthocide 50W with either rubber latex (14 per cent), Goodrite P.E.P.S., Orthocide Sticker 1017, Orthocide Sticker 1935, Shell Tenac, Dupont Spreader Sticker, or Goodrite x-75 significantly reduced the number of lesions as compared with either Bordeaux mixture 3-3-50, Spraycop 340, or Orthocide 50W alone.

The average percentage leaf infection with the fungicide-sticker treatments of 14 per cent rubber latex and Goodrite P.E.P.S. were significantly better than the rest of the treatments at 3- and 4-liter artificial rain. There were no phytotoxic effects brought about by the addition of stickers except Orthocide Stickers 1017 and 1035 which showed slight burning in the form of a few tiny white spots on the foliage. Natural rubber latex is compatible with fungicides Orthocide 50W, Parzate, Ziram, Flit 406, and Fermate. Manzate alone and Manzate plus latex showed some slight burning.

Fungicidal spraying to control foliage diseases in the Philippines and other tropical countries is often not effective because of the short duration of the effectiveness of the spray materials due to frequent rains that wash the fungicide from the leaves. The addition of an efficient sticker that would increase the retention of fungicides not only saves cost of materials but also cost of labor by less frequent spray applications.

Several authorities on spray fungicides in the tropics claim that a large number of fungicides have excellent immediate effects, but they lack the staying qualities that make them practical for use under warm and moist condition. The tropics is becoming a great field for expansion in the use of fungicides. However, its future depends on the development of an efficient sticker. Bordeaux

[1] Central Experiment Station Contribution No. 2019.

[2] The authors are grateful to the Statistical Service and Computing Section for the computations and to Mr. A. D. Yñiguez for the statistical interpretation of the data. Thanks are also due Dr. L. A. Schafer for critical reading of the manuscript.

mixture, though to some extent causes phytotoxicity, remains the most widely used fungicide because of its inherent adhesiveness which protects the foliage longer.

Horsefall (1945) claimed that during the past decades many new protectants were introduced but few have been successful. Only when the material possessed an inherent ability to cling to a surface during weathering processes was it able to succeed.

Chupp and Leiby (1953) declared that sticker and spreading agents are necessary when spraying smooth foliage plants, such as onions and cabbage. The sticker causes the spray to adhere to the foliage in spite of heavy rain or dews.

Nakagawa (1953) advised that when fungicides or insecticides are used in spray form, wetting or spreading and sticking agents should be added for a more thorough coverage and to increase the effectiveness of the spray materials.

Wellman (1954) emphasized that work is needed on toxicity and stickers with fungicides and insecticides especially in the moist tropics. Sprays and dusts are ineffective in some tropical pest problems because they do not stick long enough.

In an attempt to solve the sticker problem for sprays, Chaves (1954) devised a bioassay method for the comparative evaluation of stickers with organic fungicide SR-406. This method is based on the relative comparison of the area of inhibition produced on cultures of *Helminthosporium oryzae* Breda de Haan in Petri plates by leaf disks taken from cacao seedlings treated with fungicides alone and with adhesives before and after the plants have been exposed to natural conditions.

Twiss *et al.* (1937) stated that rubber latex is an excellent adhesive for materials which get easily wet. When no anti-coagulant is added latex will coagulate within 12 hours and form a spongy mass of rubber.

Scully (1955) claimed that a costly drawback in tropical agriculture is the fact that plant pathogens thrive as lushly as plant life. In the temperate zone, a fungus attack can be controlled by spraying but in the long tropical rainy season fungicides are washed away before they can be effective. He believes that by mixing fungicides with thin latex solution that oxidizes and clings to the plant, the answer to that problem is in sight.

Reddy and Davide (1959) developed a laboratory method to assay rubber latex and other commercial stickers for fungicidal sprays. The study showed that the maximum effectiveness of the commercial stickers is beyond the recommended rate of the manufacturers. It was shown that 14 per cent rubber latex, at 3 pints per 100 gallons, is highly promising as sticker.

The present study was undertaken to confirm whether the best dosage of stickers arrived at by the laboratory method is valid. It would determine (a) whether stickers at higher dosage lessen the effectiveness of fungicides and cause phytotoxic effects, and (b) the value of natural rubber latex when used with a number of superior spray fungicides such as carbamates, phthalimides, and quinones.

The study was conducted in the greenhouse of the Department of Plant Pathology, College of Agriculture, University of the Philippines from August, 1957 to March, 1958.

MATERIALS AND METHODS

The stickers used were the following:

1. Goodrite P.E.P.S. A product of B.F. Goodrich Chemical Co.
2. Goodrite X-75. A product of B.F. Goodrich Chemical Co.
3. Goodrite SDD (3958). A product of Goodrich Chemical Co.
4. Rubber latex (14 per cent). A product of Goodyear Rubber Co.
5. Shell Tenac. A product of Shell Co., Ltd.
6. Du Pont Spreader Sticker. A product of E.I. Du Pont de Nemours & Co.
7. Ortho Spreader Sticker. A product of California Spray Chemical Co.
8. Orthocide Sticker 1017. A product of California Spray Chemical Co.
9. Orthocide Sticker 1035. A product of California Spray Chemical Co.
10. Triton B-1956. A product of Rohm and Haas Co.

The fungicides used were the following:

1. Bordeaux Mixture 3-3-50.
2. Orthocide 50W.—Contains 60 per cent Captan (N-trichloro-

[3] C. S. Reddy and R. G. Davide. "Fungicidal Spray Stickers in the Tropics", 1957. (In press).

methylmercapto-4-cyclohexene-1, 2-dicarboximide) as active ingredient. A product of California Spray Chemical Corp.

3. Spraycop 340.—Contains 34 per cent basic copper sulfate equivalent to metallic copper as active ingredient. A product of Allied Chemical & Dye Corp.

4. Parzate.—Contains 65 per cent Zineb (Zinc ethylene bisdithiocarbamate) as active ingredient. A product of E.I. Du Pont de Nemours & Co.

5. Fermate.—Contains 76 per cent ferric dimethyldithiocarbamate as active ingredient. A product of E.I. Du Pont de Nemours & Co.

6. Manzate.—Contains 70 per cent Maneb (Manganese ethylenebisdithiocarbamate) as active ingredient. A product of E.I. Du Pont de Nemours & Co.

7. Ziram.—Contains 76 per cent Zinc dimethyldithiocarbamate as active ingredient. A product of Allied Chemical & Dye Corp.

8. Flit 406.—Contains 50 per cent N-trichloromethyl thiotetrahydrophthalimide as active ingredient. A product of ESSO.

Orthocide 50W was the standard fungicide used in the evaluation of the effectiveness of the different stickers. Bordeaux mixture and Spraycop 340 were included to compare their relative adhesiveness with the fungicide-sticker combination. The other fungicides were used only in the compatibility test of rubber latex as sticker.

Based on the manufacturer's recommendation of 2 pounds per 100 gallons of sprays, 0.962 grams of Orthocide 50W was mixed with 400 cc. of tap water in one liter flasks. Thorough shaking was made before the different stickers were added to their respective flask. The stickers were uniformly applied at the rate of 3 pints per 100 gallons or at 1.50 cc. per 400 ml. of sprays. The mixture was shaken and stirred thoroughly to insure proper combination. One of the flasks was left without any sticker to serve as the fungicide control.

The tests consisted in spraying five leaves of tobacco seedlings of uniform size. Five potted tobacco seedlings were used for each sticker-fungicide combination. Two sets with the same number of plants were provided for the control. The first set was sprayed with fungicide alone to serve as the basis for comparing the effects of fungicide-sticker treatments. The second set was sprayed with tap water to serve as the basis for evaluating the effectiveness of the

fungicide in the control of disease after application of different amounts of artificial rain. This also evaluated the fungicides for natural adhesiveness.

A Hudson Lektrik-spray (300 Wizard Sprayer) was used. It was held at a 45 degree angle at a distance of one foot from the plant and sprayed to the point of run-off. The controls were treated first, followed by the fungicide sticker treatments. The No. 1 seedling in each treatment was withheld from artificial rain to serve as the basis for comparing the effects of stickers after the application of different amounts of artificial rain. A garden type sprinkler was used to simulate artificial rain four hours after spraying. The No. 2 seedling of each treatment was sprinkled with one liter of tap water, No. 3 with two liters, No. 4 with three liters, No. 5 with four liters. The distance of the sprinkler from the plants was approximately 3 feet. After application of artificial rain, all the seedlings were inoculated with a mycelial suspension of *Cercospora nicotianne* Ell. and Everh. prepared in a Waring Blender. The inoculated seedlings were placed in the greenhouse for observation. Lesions started to appear on the sprayed leaves 8 days after inoculation.

Leaf disks (dia., 18 mm.) were taken with the use of a cork borer from sprayed healthy leaves and planted in the center of Petri plates of potato-dextrose agar containing spore suspension of the test organism, *Curvularia inaequalis* Boed. and Shear. The inhibition zone was determined 24 hours later by three diameter readings of the circular area in which spore germination was inhibited. The relation of the area of inhibition with the washed leaf disk to the inhibition area of the unwashed leaf disks indicated the degree of inhibition of sprays left on the foliage after application of varying amounts of artificial rain. The test consisted of four trials using commercial stickers and 14 per cent rubber latex. The compatibility of rubber latex with other fungicides was tested.

RESULTS AND DISCUSSIONS

Number of lesions per plant. When no artificial rain-wash followed the fungicide spraying, Orthocide 50W alone was more effective in suppressing the fungus lesions than Bordeaux Mixture 3-3-50 or Spraycop 340 alone. The difference between Orthocide 50W and Bordeaux Mixture was slightly short of the 5 per cent significance level, while that between the former and Spraycop 340 was highly

significant. Among the stickers used with Orthocide 50W, there seemed to be hardly a significant difference. This may be expected because the stickers principally improve the adhering quality of the fungicide; if they ever have any fungicidal property, this is just incidental. It may be of interest to note that the plants which did not receive any fungicide had about 34 times as much lesions as those which received Orthocide 50W

TABLE 1.—*Mean number of lesions per tobacco plant 15 days after inoculation (based on 4 trials)*

TREATMENT	ARTIFICIAL RAIN-WASH IN LITERS				
	0	1	2	3	4
Rubber Latex plus Orthocide 50W	7.00	15.50	23.00	23.25	28.25
Orthocide Sticker 1035 plus Orthocide 50W	5.75	13.00	20.00	26.00	33.75
Shell Tenac plus Orthocide 50W	5.50	14.75	22.50	28.50	34.00
Goodrite P.E.P.S. plus Orthocide 50W	6.75	13.50	17.50	12.25	35.75
Orthocide Sticker 1017 plus Orthocide 50W	6.75	14.75	20.50	29.75	39.75
Dupont Spreader Sticker plus Orthocide 50W	10.25	14.75	25.75	30.00	43.75
Goodrite X-75 plus Orthocide 50W	4.75	14.25	25.75	37.25	45.25
Ortho Spreader Sticker plus Orthocide 50W	8.50	16.25	26.75	45.50	58.25
Goodrite SDD (3958) plus Orthocide 50W	8.75	28.25	38.50	48.50	65.00
Triton B-1956 plus Orthocide 50W	12.75	31.50	44.25	54.75	70.00
Orthocide 50W (alone)	6.75	26.00	43.25	53.25	82.25
Spraycop 340 (alone)	55.25	94.25	150.25	166.50	195.75
Bordeaux Mixture 3-3-50 (alone)	9.25	15.25	29.75	37.75	53.00
Tap water	230.00	238.00	253.00	293.50	290.75

H.S.D. 5% = 3.13
1% = 3.66

With one liter of artificial rainwash, Orthocide 50W was less effective than Bordeaux Mixture in suppressing fungus lesions, but better than Spraycop 340. Among the stickers used with Orthocide 50W, Orthocide Sticker 1035 and P.E.P.S. seemed to be the most effective, although not significantly better than Shell Tenac, Dupont Spreader, Orthocide Sticker 1017, Goodrite X-75, or Rubber Latex. Ortho Spreader sticker, Goodrite SDD (3958), and Triton B-1956 were decidedly poorer than the former group. The last two were even poorer than Orthocide 50W without any sticker.

With two liters of rainwash, Spraycop 340 was next to Tap Water in number of lesions. Orthocide 50W was much better but Bordeaux Mixture 3-3-50 was the best among those treatments which were not accompanied by stickers. Among the stickers, Triton B-1956 and Goodrite SDD (3958) were the poorest (i.e., they had the most number of lesions), while Goodrite P.E.P.S., Orthocide Sticker 1035, Orthocide Sticker 1017, Shell Tenac, and Rubber Latex were the most effective.

But for a few changes, like the shift of Rubber Latex to second place, the order of effectiveness of the stickers was maintained in the three liter rainwash. In the four liter rainwash, Rubber Latex was the best sticker, followed by Orthocide Sticker 1035, Shell Tenac and Goodrite P.E.P.S. Although the other stickers combined with Orthocide 50W were significantly better than the fungicide alone, their effectiveness was not very remarkable. For convenience in further testing, these stickers may be eliminated.

Again, Bordeaux Mixture 3-3-50 was the best among the fungicides not accompanied by stickers.

TABLE 2.—*Mean percentage of infected leaves per tobacco plant 15 days after inoculation (based on 4 trials)*

TREATMENT	ARTIFICIAL RAIN-WASH IN LITERS				
	0	1	2	3	4
Goodrite P.E.P.S. plus Orthocide 50W	40	60	60	70	80
Rubber Latex plus Orthocide 50W	45	50	65	75	80
Orthocide Sticker 1017 plus Orthocide 50W	45	55	65	70	90
Shell Tenac plus Orthocide 50W	35	50	65	80	90
Orthocide Sticker 1035 plus Orthocide 50W	50	60	60	85	90
Goodrite X-75 plus Orthocide 50W	40	75	75	80	90
Triton B-1956 plus Orthocide 50W	65	70	85	100	100
Goodrite SDD (3958) plus Orthocide 50W	40	70	75	90	100
Ortho Spreader Sticker plus Orthocide 50W	50	65	65	90	100
Dupont Spreader Sticker plus Orthocide 50W	55	60	75	85	100
Orthocide 50W (alone)	45	65	90	95	100
Bordeaux mixture 3-3-50	55	70	85	95	100
Spraycop 340	85	90	100	100	100
Tap water	100	100	100	100	100

H.S.D. 5% = 16.53
1% = 18.94

Leaf disks inhibition test. In the average percentage degree of inhibition left on the sprayed leaves after application of different amounts of artificial rain on 4 trials, the results showed that rubber latex (14 per cent) and P.E.P.S. obtained the highest percentage degree of inhibition at 4-liter rain-wash (fig. 1). They were followed by sticker-fungicide treatments of Orthocide Sticker 1017, Goodrite X-75, Ortho Spreader Sticker, Triton B-1956, and Goodrite SDD (3958). The treatment of Orthocide 50W alone obtained the lowest percentage degree of inhibition at 4-liter artificial rain application. The fungicide Spraycop 340 and Bordeaux mixture 3-3-50 did not show any clear inhibition zone around the leaf disk (table 3).

Fig. 1. Inhibitory effects of Orthocide 50W in combination with stickers upon the growth of *Curvularia inaequalis* Boed. and Shear. The leaf disks at center in the upper row of Petri plates were taken from the previously sprayed leaves after 4-liter artificial rain-wash while the leaf disks at the lower row were from the unwash leaves of tobacco. 1-2, Orthocide 50W alone; 3-4, Orthocide 50W plus rubber latex; 5-6, Orthocide 50W plus Shell Tenac; 7-8, Orthocide 50W plus P.E.P.S.; 9-10, tap water. (*Photographed by the Photographic Division*).

TABLE 3.—*Average percentage degree of inhibition to Curvularia inaequalis by sprays left on the sprayed leaves after application of varied amounts of artificial rain (based on 4 trials)*

TREATMENT	ARTIFICIAL RAIN-WASH IN LITERS			
	1		3	4
Rubber Latex plus Orthocide 50W	93.77	86.36	78.35	70.22
Goodrite P.E.P.S. plus Orthocide	95.50	84.02	77.40	69.55
Orthocide Sticker 1017 plus Orthocide 50W	85.60	77.75	72.15	63.40
Orthocide Sticker 1035 plus Orthocide 50W	80.75	76.07	68.05	60.30
Shell Tenac plus Orthocide 50W	85.55	72.10	65.02	58.90
Dupont Spreader Sticker plus Orthocide 50W	90.00	79.60	68.72	57.85
Goodrite X-75 plus Orthocide 50W	83.22	72.85	65.12	55.52
Ortho Spreader Sticker plus Orthocide 50W	85.37	72.82	61.80	54.82
Triton B-1956 plus Orthocide 50W	82.65	69.75	62.42	52.77
Goodrite SDD (3958) plus Orthocide 50W	80.20	64.55	53.87	38.45
Orthocide 50W (alone)	70.82	60.65	54.75	35.18
Tap water	0	0	0	0

Note: Spraycop 340 and Bordeaux mixture did not show any inhibition zone.

Compatibility test of rubber latex with promising fungicides. Rubber latex at 3 pints per 100 gallons is compatible with Fermate, Parzate, Ziram, Flit 406, and Manzate each at 2 pounds per 100 gallons. The addition of rubber latex as sticker greatly increased the retention of sprays and afforded a longer period of protection to tobacco leaves against *Cercospora nicotianae* Ell. and Everh. The latex-fungicide combination remarkably reduced the number of lesions per plant as compared with fungicide alone in all amounts of artificial rain. All the fungicide treatments were effective against the test organism (table 4).

TABLE 4.—*Results showing the compatibility of rubber latex with different fungicides based on the mean number of lesions per plant 15 days after inoculation (based on 4 trials)*

TREATMENT	ARTIFICIAL RAIN-WASH IN LITERS				
	0	1	2	3	4
Fermate	8.25	17.00	21.50	29.00	38.00
Fermate plus Rubber Latex	7.76	9.50	11.75	16.25	20.50
Parzate	3.75	10.00	12.75	20.00	24.00
Parzate plus Rubber Latex	7.25	8.25	9.00	11.00	14.50
Ziram	12.00	15.25	14.75	20.00	24.75
Ziram plus Rubber Latex	6.25	7.00	10.00	13.25	18.75
Flit 406	5.00	9.50	21.75	25.75	29.50
Flit 406 plus Rubber Latex	3.50	7.75	12.50	13.00	16.75
Manzate	4.00	8.75	14.00	27.25	33.75
Manzate plus Rubber Latex	3.25	6.00	9.50	13.50	17.00
Tap water	121.99	195.33	176.99	163.66	208.00

The leaf disk inhibition test on Petri plates seeded with the test organism, *Curvularia inaequalis* Boed. and Shear, showed that addition of rubber latex to Fermate, Flit 406, and Ziram exhibited a much higher percentage degree of inhibition than the fungicides alone after the 4-liter rain-wash (table 5). Manzate and Parzate with and without latex did not show inhibition zones. This indicates that they are only effective against *Cercospora nicotianae* Ell. and Everh. and not against *Curvularia inaequalis* Boed. and Shear *in vitro*. Manzate with and without latex caused some phytotoxicity in the form of a few white spots.

The over-all results of this experiment indicate that stickers significantly increased the spray retention and afforded the tobacco seedlings longer protection against *Cercospora nicotianae* Ell. and Everh. Rubber latex and P. E. P. S. were the best stickers followed by Orthocide Sticker 1017, Shell Tenac, Orthocide Sticker 1035, and Goodrite X-75.

TABLE 5.—*Average percentage degree of inhibition to Curvularia inaequalis by fungicides left on sprayed leaves of tobacco after application of varied amounts of artificial rain (based on 4 trials)*

TREATMENT	ARTIFICIAL RAIN-WASH IN LITERS			
	1	2	3	4
Fermate	73.6	54.9	37.2	26.2
Fermate plus Rubber Latex	81.0	80.0	78.0	58.5
Flit 406	90.0	71.3	32.1	17.7
Flit 406 plus Rubber Latex	93.2	77.7	71.6	58.4
Ziram	66.4	60.0	40.0	28.4
Ziram plus Rubber Latex	71.8	69.2	65.0	50.0

Note: Parzate and Manzate did not show any inhibition zones.

Under Philippine conditions, it is more economical to use rubber latex as a fungicidal spray sticker. According to Reddy (1957), the cost of natural rubber latex is much less than commercial stickers. The large plantation owner who would use a sticker in quantity may find it more rewarding to grow a few rubber trees of his own because latex, when taken directly from the tree and combined with 40 cc. of one per cent ammonia per liter, could be used at the rate of a quarter ounce per gallon of spray. However, it should be diluted with part of the spray water and strained into the spray can.

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CYTOTAXONOMIC STUDY OF THE FIBER-PRODUCING *MUSA* IN THE PHILIPPINES

I. CHROMOSOME NUMBERS IN THE SECTION *AUSTRALIMUSA* [1]

JUAN V. PANCHO and JOSE M. CAPINPIN

WITH ONE PLATE OF TWENTY-FIVE FIGURES

Chromosome counts in 73 varieties of abaca in the section *Australimusa* of the genus *Musa* seem to indicate that 10 is the basic number. Meiotic and somatic observations reveal absence of chromosomal irregularities. An atypical form with somatic count of 21 chromosomes is also reported.

The present paper deals with the determination of chromosome numbers in the section *Australimusa* of the genus *Musa* as an integral part of a long-range investigation into the taxonomy, genetics, and evolution of species in the genus. Chromosome number is now recognized by cytogeneticists and systematists as a new independent criterion of classification of plants and animals on a natural, that is, genetic basis.

This research was planned with a view to the utilization of cytological data as a foundation for taxonomic grouping as well as the application of cytotaxonomic information to problems of phylogenetic relationship among members of the section *Australimusa*.

MATERIALS AND METHODS

The materials for this work were collected from different regions of the islands including the Guinobatan Abaca Experiment Station, Albay; Bago Oshiro Abaca Experiment Station, Davao; Economic Garden, Los Baños, Laguna and the College of Agriculture, Laguna.[2]

Chromosome counts were determined from root tip preparations fixed in CRAF, embedded in Tissuemat, cross-sectioned at 15μ and

[1] Central Experiment Station Contribution No. 2020.

[2] The authors wish to thank the superintendent and personnel in-charge of abaca projects.

stained with Harris Hematoxylin (instead of crystal violet) according to the method of Randolph (1940). Attempts to obtain satisfactory acetocarmine root tip squashes were unsuccessful. In this study, only transverse sections of the root tips of actively growing plants were used. As a further check on the results of those somatic counts, examinations of the microsporocytes were made according to the technique described by Smith (1947). Camera lucida drawings were made at a magnification of *ca.* 5000 and reduced in reproduction to *ca.* 3350. Herbarium specimens and preserved flower buds of all the forms studied were prepared and were deposited in the College of Agriculture Herbarium, University of the Philippines, Los Baños, Laguna for future reference.

OBSERVATIONS AND DISCUSSIONS

Table 1 shows that 73 forms of *Australimusa* studied cytologi-

TABLE 1.—*Chromosome numbers in the Section Australimusa*

FORMS OF AUSTRALIMUSA	SOURCE AND SPECIMEN NUMBER	CHROMOSOME NO.[6]	
		2n	n
Musa textilis vars.			
1. Abuab [3]	CESCL,[4] JVP-1003	—	20
2. Aguikikon	CESCL, JVP-1010	—	20
3. Agutay	CESCL, JVP-1117	—	20
4. Amukid	CESCL, JVP-1116	—	20
5. Alman	CESCL, EGL,[5] JVP-1191, 1126	—	20
6. Alinsanay Pula	EGL, JVP-1158	10	—
7. Bagacayon	GESA [7] JVP-1152	10	—
8. Bagacayon Kidit	GESA, JVP-1161	—	20
9. Baguisanon (probably the same as Banguisanon)	BOESD,[8] JVP-1138	—	20
10. Balunan	CESCL, JVP-1132	—	20
11. Binagacay	GESA, JVP-1159	10	—
12. Binognoran	CESCL, JVP-1005	—	20
13. Binuag	CESCL, JVP-1130	—	20
14. Binukid	CESCL, Valmayor *et al.* 1956	10	—
15. Black Maguindanao	BOESD, JVP-1141	10	—
16. Bongkokanon	CESCL, JVP-1002	—	20

[3] The varietal names adopted in this work are those used in the locality where collected.

[4] CESCL = Central Experiment Station, College, Laguna.

[5] EGL = Economic Garden, Los Baños, Laguna.

[6] All determinations (except numbers 14, 17, 42, 46, 49, 54, 60, 64 and 73) are by the authors.

[7] GESA = Guinobatan Experiment Station, Albay.

[8] BOESD = Bago Oshiro Experiment Station, Davao.

TABLE 1 (continued)

FORMS OF AUSTRALIMUSA	SOURCE AND SPECIMEN NUMBER	CHROMOSOME NO.[6]	
		n	2n
17. Bungolanon	CESCL, Valmayor *et al.* 1956	10	—
18. Bungolanon Davao	BOESD, JVP-1144	—	20
19. Bungolanon Leyte	BOESD, JVP-1143	—	20
20. Bungolanon Puti	BOESD, JVP-1145	—	20
21. Borogtognon	GESA, JVP-1160	10	—
22. Bulao	GESA, JVP-1156	10	—
23. Bulao Luno	CESCL, JVP-1008; EGL, JVP-1189	—	20
24. Canarajon	CESCL, JVP-1136; EGL, JVP-1202	—	20
25. Casilihon	CESCL, JVP-1001	—	20
26. Deguma	GESA, JVP-1148	—	20
27. Giabaque	CESCL, JVP-1133; EGL, JVP-1200	—	20
28. Inagutay	GESA, JVP-1157	10	—
29. Inisarog	CESCL, JVP-1112; EGL, JVP-1181	—	20
30. Inosa	CESCL, JVP-1151; EGL, JVP-1183	—	20
31. Kambayado	CESCL, JVP-1120	—	20
32. Korokotohan	CESCL, JVP-1004	—	20
33. Kurisan Pula	CESCL, JVP-1006	10	—
34. Laguis	CESCL, JVP-1127;	—	20
35. Lagunoy (probably the same as Lagonoyon)	CESCL, JVP-1137; EGL, JVP-1204	—	20
36. Lagurhon	CESCL, JVP-1123	—	20
37. Lausigon	GESA, JVP-1153; EGL, JVP-1147	—	20
38. Lawisig #17	CESCL, JVP-1129	—	20
39. Layahon	EGL, JVP-1197	—	20
40. Laylay	CESCL, JVP-1125	—	20
41. Libutanay	CESCL, JVP-1128	10	—
42. Libuton	Philippines, White, 1928	—	20
43. Linawa-an	CESCL, JVP-1134; EGL, JVP-1192	—	20
44. Linobloban	CESCL, JVP-1113	—	20
45. Magsarapong	BOESD, JVP-1146; EGL, JVP-1193	—	20
46. Maguindanao	CESCL, Valmayor, *et al.* 1956; Philippines, White, 1928	10	—
47. Mayon 2,000	GESA, JVP-1166	—	20
48. Minay	GESA, JVP-1150	—	21
49. Minay	CESCL, Valmayor, *et al.* 1956	—	20

TABLE 1 (continued)

FORMS OF AUSTRALIMUSA	SOURCE AND SPECIMEN NUMBER	CHROMOSOME NO.[6]	
		n	2n
50. Mininonga	CESCL, JVP-1136; EGL, JVP-1196	—	20
51. Panaroon	GESA, JVP-1167	—	20
52. Popoonan	CESCL, JVP-1121	—	20
53. Puti-Tumatagacan	GESA, JVP-1124	10	—
54. Putian	Philippines, White	—	20
55. Sabahon	CESCL, JVP-1005	—	20
56. Sairaya	GESA, JVP-1165	10	—
57. Samina	CESCL, JVP-1118; EGL, JVP-1184	—	20
58. Samuro	EGL, JVP-1185	—	20
59. Samurong Pula	GESA, JVP-1163	10	—
60. Sinaba	Philippines, White, 1928	—	20
61. Sinalampago	CESCL, JVP-1011	—	20
62. Sogmad	GESA, JVP-1153	10	—
63. Suayo	BOESD, JVP-1142	—	20
64. Tangongon	Philippines, White, 1928	—	20
65. Tangongon Bahion	BOESD, JVP-1139	—	20
66. Tangongon Lawa-an	BOESD, JVP-1140	10	—
67. Tarocan	CESCL, JVP-1007	—	20
68. Tinawagan Pula	GESA, JVP-1148	10	—
69. Tinawagan Puti	GESA, JVP-1162; EGL, JVP-118	10	—
70. Totopson	GESA, JVP-1164	10	—
71. Turutagacan	CESCL, JVP-1002	—	20
72. Ugarom	CESCL, JVP-1115	10	—
73. *Musa balbisiana* × *M. textilis*	CESCL, Bernardo, 1957	—	21

cally and reported in the Philippines as well as overseas indicate that 10 chromosome seems to be the basic number in this section. Quite a number of chromosome counts were based on the meiotic phase from pollen mother cells (PMC) which indicate the haploid number and in the root tips representing somatic phase. The meiotic configurations of all PMC smears appeared to be regular and normal (figs. 1, 3, 4, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 24 & 25). There was apparent absence of chromosal irregularities such as occurrence of rings, multivalents, and univalents. One interesting account in this report was the occurrence of 21 chromosomes in the diploid phase. This is shown in forms nos. 48 and 73. The present report on the Minay or its cultivar shows a 21 chromosome count whereas Minay with accession

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Explanation of Figures 1–25

Figs. 1–25. Chromosomes of Certain Varieties in *Musa textilis*. Figs. 2, 5, 13, 22 and 23 show diploid complements of chromosomes from nuclei of root tip cells. Fig. 1. Anaphase I in *Alinsanay Pula* showing normal segregation of chromosomes. Fig. 2. *Alman*, 20 chromosomes. Fig. 3. Metaphase I in *Bagacayon* with ten bivalents. Fig. 4. Prometaphase I in *Bagacayon*, with ten bivalents. Fig. 5. *Bongkokanon*, 20 chromosomes. Fig. 6. Metaphase I in *Binagacay*, with 10 bivalents. Fig. 7. Telophase I of *Black Maguindanao*, with 10:10 distribution of the chromosomes to the daughter cells. Fig. 8. Meiotic metaphase in *Binukid*, with ten pairs of chromosomes. Fig. 9. Metaphase I in *Borogtognon*, with ten bivalents. Fig. 10. Meiotic metaphase in *Bulao* with all chromosomes evenly paired. Fig. 11. Prometaphase I in *Inagutay* with ten bivalents. Fig. 12. Metaphase I in *Kurisan Pula* with ten bivalents. Fig. 13. *Lausigon*, 20 chromosomes. These are much longer and much straighter than in most forms. Fig. 14. Telophase I of *Libutanay* with 10:10 distribution of chromosomes to the daughter cells. Fig. 15. Prometaphase I in *Puti-Tumatagacan* with ten bivalents. Fig. 16. Metaphase I of Sogmad with ten bivalents. Fig. 17. Anaphase I in *Tangoñgon Lawa-an* with 10:10 distribution of the chromosomes to the daughter cells. Fig. 18. Diakinesis in *Sairaya* showing ten bivalents. Fig. 19. Diakinesis in *Tinawagan Pula* showing ten bivalents. Fig. 20. Meiotic metaphase in *Tinawagan Puti* with all chromosomes evenly paired. Fig. 21. Meiotic metaphase in *Totopson*, with ten pairs of chromosomes. Fig. 22. *Magsarapong*, 20 chromosomes. Fig. 23. *Linawa-an*, 20 chromosomes. Fig. 24. Diakinesis in *Ugarom* showing the dyads more elongated than in most forms. Fig. 25. Metaphase I in *Samurong Pula* with 10 bivalents.

no. 49 as reported by Valmayor *et al.* (1956) gave a count of 20. An inquiry regarding the conflicting reports is unfruitful for no specimen of Valmayor's report is accessible.

The form Minay (#48) as reported here is the common name derived from its place of origin. A chromosome count of 21 indicates that this atypical number may be either a trisomic form or a mutant form with a heteroploid number of chromosome. If the basic number is 10, the count of 21 represents one additional member, i.e., (2n + 1). The changes in the chromosome number are likely to happen in all plant species capable of sexual as well as asexual means of reproduction. On the other hand, another plant with chromosome count reported by Bernardo (1957) is assumed to be a putative hybrid between *Musa balbisiana* and *M. textilis.*

This present form of Minay (# 48) can be considered as either a mutation or a result of introgression between *M. balbisiana* (2n = 22) and *M. textilis* (2n = 20). On the whole, however, the number of 10 chromosomes remains to be the predominant count for *Australimusa.*

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EFFECT OF CROSSING ON EGG PRODUCTION CHARACTERS IN CHICKENS [1]

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One hundred and forty pullets hatched from seven matings of three breeds, namely Fayomi (F), White Leghorn (W.L.), and Rhode Island Red (R.I.R.), in addition to four crosses of F. with W.L. and R.I.R. were used in the study.

The F. pullets laid their first eggs earlier than W.L. and R.I.R. pullets. Crossbreds attained sexual maturity at intermediate ages between parents. Body weight at sexual maturity was 1042, 1477, and 1891 gms for F., W.L., and R.I.R. respectively. Crosses of R.I.R. parents were heavier in weight at sexual maturity than those of W.L. parents.

The number of eggs laid per female until 500 days of age was 164, 155, and 127 for F., W.L., and R.I.R. respectively. The W.L. × F. and F. × W.L. laid more eggs than their parents, the R.I.R. × F. and F. × R.I.R. crosses laid intermediate numbers between F. and R.I.R. The average weight of eggs laid until 500 days of age was 41, 53, and 53 gms. for F., W.L., and R.I.R. respectively. Crossbreds laid eggs of intermediate size between the parents.

The amount of feed utilized to produce one pound of eggs were 5.0, 5.1, and 4.3 lbs. for F., W.L., and R.I.R. respectively, as computed from sexual maturity until the 68th week of age. The W.L. × F. and F. × W.L. crossbreds showed better converting ability than their parents, while the R.I.R. × F. crosses utilized feed almost as efficiently as R.I.R.

In raising the productivity of native breeds of chickens, several preliminary trials should be made in crossing the imported standard pure breeds with the native under the normal conditions of management and environment in the receptor country, before large scale cross breeding is adopted. In this study, the Fayomi (F), a native breed getting to be known in other countries like the U.S.A., was crossed with light and dual purpose breeds and the productivity of the pure and cross breeds was compared.

REVIEW OF LITERATURE

Age at Sexual Maturity. The heritability of age at sexual ma-

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turity ranged from 26 (Shoffner and Sloan, 1948) to 40 per cent (Peeler, Glazener and Blow, 1955). Hays (1932) stated that early sexual maturity seems to be dominant in crossing with late maturing forms. Greenweed and Blyth (1951) ascertained a sex linked gene and an autosomal one to be involved in the inheritance of sexual maturity. Early matured pullets lay a larger number of eggs, smaller in size than do late maturing ones (Tanka and Rosenberg, 1952). Crossbreeding results in early sexual maturity in comparison to purebred hens (Wodzinowski, 1954). Znaniecka, Wodzinowski, and Korzeniewska (1955) stated that this is a big improvement in comparison to the late maturing parents, but not much as compared to the early maturing ones. However, Waters (1934) showed that the crossbreds may lay their first egg at intermediate ages between the two parents. Inbreeding, on the other hand, has little or no effect on age at sexual maturity (Blow and Glazener, 1953).

Egg Number. King and Bruckner (1952) stated that sex linked genes are involved in the inheritance of egg number. The heritability of this character ranges from 22 to 40 per cent (De Miranda, 1954). The number of eggs laid by crossbreds in the first laying year is intermediate between the two parents (Gonzalez Chapel, 1950). Crossbreds may also exceed both parents in this respect (Wodzinowski, 1954). Blow and Glazener (1953) stated that inbreeding decreases egg number.

Egg Size. Hays (1937) demonstrated that egg size depends on three dominant genes, while Roberts, Card, and Shaklee (1952) suggested that egg weight is influenced by several recessive genes. A sex linked gene was found to be involved in the inheritance of egg weight by King and Bruckner (1952). But Osborne (1954) reported a lack of sex linkage in the inheritance of egg size. Maternal effects were also found by Waters (1945) to influence egg weight, but the results of Osborne (1954) deny the existence of this influence. The heritability of egg size ranges from 52 to 61 per cent (Shoffner and Sloan, 1948). The eggs laid by crossbreds are intermediate in size between that of their parents (Roberts, Card and Shaklee, 1952). Blow and Glazener (1953) found that inbreeding had no effect upon egg size.

Feed consumption. Joshi, Shaffner and Jull (1949) found that hens laying at a rate of 72 per cent, used approximately 71 per cent of the feed consumed for body maintenance, 27 per cent for egg production, and 2 per cent for the increase in body weight. They stated

also that when the feed used for maintenance and increase in body weight is deducted, the lower producing birds used feed for egg production as efficiently as do the higher producing ones. On this basis, and according to the results of Byerly (1941), it can be concluded that for the same egg production, the light birds require less feed per female and per pound of eggs. A positive correlation exists between feed efficiency and both rate of egg production (Byerly, 1941) and total egg weight (Bird and Sinclair, 1939). Crossbreds are known to be more efficient in converting feed into eggs than the pure breeds (Znaniecka, Wodzinowski and Korzeniewska, 1955).

MATERIALS AND METHODS

Males	*Matings*	*Females*	*Symbol*
1. Fayomi	×	Fayomi	F.
2. White Leghorn	×	White Leghorn	W.L.
3. Rhode Island Red	×	Rhode Island Red	R.I.R.
4. White Leghorn	×	Fayomi	W.L. × F.
5. Fayomi	×	White Leghorn	F. × W.L.
6. Rhode Island Red	×	Fayomi	R.I.R. × F.
7. Fayomi	×	Rhode Island Red	F. × R.I.R.

Twenty females and two males were involved in each mating. The birds were fed on well balanced rations according to the state and age of chickens. The rations were supplemented with vitamins, antibiotics, animal proteins, and green matter. Males were kept with females for two weeks before collecting eggs for incubation. Out of the seven matings, a total of 891 eggs were collected during ten days. A total of 545 chicks were hatched, from which 62 were Fayomi, 57 White Leghorn, 63 Rhode Island Red, 107 W.L. × F., 92 F. × W.L., 100 R.I.R. × F., and 64 F. × R.I.R. Chicks were reared in floor brooder. All the chicks were reared and treated under the same management and environmental conditions of a standard poultry farm under Egyptian conditions.

At 12 weeks of age, twenty females out of each mating were wing banded and kept in a separate pen with a double yard. Pullets were fed sufficient amounts of feed which were weighed and provided daily. Feed hoppers were used to avoid wastage of feed. The total pounds of feed were estimated for each pen every four weeks throughout the experimental period to approximate the efficiency of feed utilization. The date and age at first egg and the body weight

at sexual maturity were recorded for each pullet. Pullets were trap-nested, and eggs were weighed daily until the pullets attained 500 days of age. Statistical analysis were done after Snedecor (1956).

RESULTS AND DISCUSSION

Age at sexual maturity. The Fayomi pullets laid their first egg at an average age of 167 days, (table 1). The two crosses W.L. × F. and F. × W.L. attained sexual maturity at approximately the same age. The R.I.R. × F. and F. × R.I.R. crosses laid their first eggs at later ages. The differences in age at sexual maturity were highly significant. All the breeds and crosses were found to lay their first egg within July, except F. × R.I.R. and R.I.R. which laid their first egg on August 1 and September 23, respectively (table 1).

TABLE 1.—*Age at sexual maturity*

BREEDS AND CROSSES	AVERAGE DATE OF 1ST EGG	AGE OF SEXUAL MATURITY (DAYS)		
		Range	Mean = S.E.	C.V. %
F.	14 July	124–210	166.65 ± 5.10	13.68
W.L.	27 July	157–220	179.93 ± 4.90	10.50
R.I.R.	23 Sept.	166–335	238.30 ± 10.82	20.31
W.L. × F.	18 July	151–207	171.20 ± 3.46	9.03
F. × W.L.	19 July	141–208	172.45 ± 3.87	10.04
R.I.R. × F.	24 July	142–204	177.30 ± 3.38	8.54
F. × R.I.R.	1 Aug.	138–223	185.00 ± 5.42	13.10

The attainment of sexual maturity occurs at a certain age and body weight which vary from one breed or strain to another. Generally speaking, the heavier the breed the later is the age at sexual maturity. However, many environmental factors can act upon this character, such as date of hatch, nutrition, intensity of light, and temperature. The Fayomi birds, being the smallest in size, attained sexual maturity earlier than W.L. or R.I.R. The big delay of the R.I.R. females in attaining sexual maturity might be due to breed differences and to the fact that they were faced with the long hot days of summer before laying the first egg. This was also observed in the F. flock in the studies of Hafez and Kamar (1055) under the same conditions, when the hatches were late in the season and the time of attaining sexual maturity elapsed during the beginning of summer. Increasing the number of daylight hours may also delay sexual maturity (Jeffrey and Platt, 1951). The differences among

pure breeds at the onset of sexual maturity led to the importance of reckoning the best time of hatching for every breed in order to avoid the unfavourable effect of summer on sexual maturity.

The crossbreds W.L. × F. and F. × W.L. pullets laid the first egg at an average age approximately midway between F. and W.L., while the R.I.R. × F. and F. × R.I.R. females attained sexual maturity earlier than the intermediate ages of their parents.

The body weight of the females at sexual maturity was higher in R.I.R. than W.L. and F. (table 2). The F. × W.L. and W.L. × F. crosses were nearly the same at sexual maturity, while there were large differences between R.I.R. × F. and F. × R.I.R. The differences in body weight at sexual maturity were highly significant. The weight of the first egg and the weight of the first ten eggs laid by the pure and cross breeds exhibited the same trend. The F. pullets laid the smallest eggs, whereas the R.I.R. pullets laid the heaviest among the purebreds (tables 3 and 4). The first ten eggs laid by F. × W.L. and W.L. × F. pullets had approximately the same average weights, while there was a large difference between the average

TABLE 2.—*Average weight of female at sexual maturity (grams)*

BREEDS AND CROSSES	RANGE	MEAN ± S.E.	C.V. %
F.	770–1480	1042.55 ± 37.28	15.99
W.L.	1207–1680	1477.28 ± 32.73	8.29
R.I.R.	1510–2580	1891.00 ± 70.34	16.63
W.L. × F.	1060–1570	1233.10 ± 25.07	9.09
F. × W.L.	962–1680	1211.45 ± 36.79	13.58
R.I.R. × F.	1142–1550	1302.40 ± 27.70	9.51
F. × R.I.R.	1142–1890	1509.90 ± 43.02	12.74

TABLE 3.—*Weight of the first egg laid (grams)*

BREEDS AND CROSSES	RANGE	MEAN ± S.E.	C.V. %
F.	24–42	32.40 ± 1.08	14.93
W.L.	35–53	41.28 ± 1.24	11.22
R.I.R.	35–57	48.15 ± 1.46	13.58
W.L. × F.	30–43	36.90 ± 0.90	10.94
F. × W.L.	30–44	36.10 ± 0.73	9.07
R.I.R. × F.	29–48	36.15 ± 1.01	12.44
F. × R.I.R.	35–49	41.85 ± 1.77	18.88

TABLE 4.—*Average weight of the first ten eggs laid (grams)*

BREEDS AND CROSSES	RANGE	MEAN ± S.E.	C.V. %
F.	30.50–42.00	34.66 ± 0.67	8.62
W.L.	41.30–48.50	44.77 ± 0.64	5.31
R.I.R.	40.40–59.50	50.54 ± 1.20	10.67
W.L. × F.	35.00–47.80	39.50 ± 0.73	8.23
F. × W. L.	35.10–46.30	39.32 ± 0.64	7.25
R.I.R. × F.	32.80–47.20	38.63 ± 0.79	9.12
F. × R.I.R.	36.00–50.60	43.68 ± 0.98	10.04

weight of the first ten eggs of R.I.R. × F. and F. × R.I.R. The differences in the average weight of the eggs were highly significant.

Egg number. The number of eggs increased rapidly after the attainment of sexual maturity until August for all breeds and crosses except for R.I.R. and F. × R.I.R. which continued the increase until September. There was a drop in egg production during September and October for all the breeds and crosses except for R.I.R. and F. × R.I.R. which had their drop in October. By December, the pullets started again to lay more, and all the breeds and crosses reached the peak in March. Egg production, however, declined during June.

The total number of eggs laid per living female until 500 days of age was higher for the F. than the other breeds. The intensity of laying, measured as the number of eggs laid during the best two consecutive months (Dryden, 1921) which were March and April in this study, also proved that F. surpassed both W.L. and R.I.R. However, the number of eggs laid by W.L. or R.I.R. was found by many investigators to be much more than found in this experiment (Lerner, 1950). This may indicate that the environmental conditions in Egypt played a great role in determining the number of eggs laid by the fowl. The number of eggs laid by W.L. × F. and F. × W.L. was nearly the same and was higher than both parents (table 5). The number of eggs laid by R.I.R. × F. and F. × R.I.R. was almost the same, being intermediate between the two parents. It seems that crossing the two high producing breeds, F. and W.L., gives rise to better genetic constitutions, while crossing F. with R.I.R. gives rise to intermediate hereditary make ups. The differences in egg number were highly significant.

TABLE 5.—*Average number of eggs laid per female until 500 days of age*

BREEDS AND CROSSES	RANGE	MEAN ± S.E.	C.V. %
F.	104–222	163.50 ± 8.48	23.21
W.L.	76–221	154.64 ± 9.18	26.56
R.I.R.	43–200	126.80 ± 9.00	31.75
W.L. × F.	132–219	172.70 ± 5.88	15.23
F. × W.L.	93–235	173.95 ± 8.74	22.47
R.I.R. × F.	66–258	158.05 ± 9.99	28.27
F. × R.I.R.	88–227	158.55 ± 8.57	24.18

Egg weight. The egg size for all the breeds and crosses increased until December (at 48 weeks of age), where it remained approximately stable. Nearly the same age (10 months) was found by Veiga and Raimo (1940). Egg size reached its peak during March in all the groups studied (table 6). At the end of the laying season, espe-

TABLE 6.—*Average weight of eggs laid per living female at the different months (grams)*

MONTHS	BREEDS AND CROSSES						
	F.	W.L.	R.I.R.	W.L. x F.	F. x W.L.	R.I.R. x F.	F. x R.I.R.
June	31.45	0.00	0.00	33.00	34.47	34.17	38.68
July	33.98	42.46	39.71	38.92	38.70	36.40	40.93
August	36.63	46.15	46.14	41.22	41.69	39.91	44.73
September	37.76	47.69	48.74	41.71	42.04	39.56	46.37
October	41.07	52.12	50.95	47.15	45.36	43.62	49.43
November	43.02	54.08	53.42	49.19	48.95	47.22	53.90
December	43.43	55.28	53.93	49.19	48.50	47.92	52.06
January	42.46	54.71	54.77	48.93	48.10	47.10	53.01
February	42.43	55.03	54.32	48.84	47.79	47.33	53.34
March	43.35	55.21	55.11	49.01	47.90	47.36	52.66
April	42.01	53.44	54.06	48.05	46.88	46.73	51.00
May	41.42	53.03	53.49	47.73	47.44	45.97	51.72
June [a]	42.91	53.99	53.68	48.17	47.94	46.08	51.86
Average	40.88	52.54	53.41	46.77	46.12	45.27	50.73

[a] Eggs of the first twelve days only (the end of the experiment).

cially after April, the pullets showed a tendency to lay smaller eggs. The highest average weight of eggs laid during the 500 days was attained by R.I.R. followed by W.L. and then F. The average weight of eggs laid during the period of study for W.L. and R.I.R. did not differ markedly from the results obtained by other workers such as Funk and Kempster (1934). This may indicate that egg size is less

affected by environmental conditions than egg number. The average egg weight of W.L. × F. and F. × W.L. was about the same, while that of R.I.R. × F. and F. × R.I.R. differed significantly. However, all the crossbreds laid eggs of intermediate size between their parents. These results may substantiate the suggestions of Roberts, Card, and Shaklee (1952) that egg size is influenced by several recessive genes. The total mass of eggs laid by the fowl until 500 days of age (the number multiplied by the weight of eggs) was higher for W.L. than for R.I.R. and F. All the crossbreds proved to surpass F. in this respect.

Feed efficiency. The total pounds of feeds consumed per female from 12 weeks until 500 days of age increased gradually with age and was lower for F. than for R.I.R. and W.L. The F. × R.I.R. cross consumed the largest amount of feed among the crosses. The amount of feed per pound of eggs increased gradually after the 28th week of age, except for R.I.R. and F. × R.I.R. The increase reached its peak at the 36th to 40th week of age in all breeds and crosses, and began to decrease afterwards (table 7). After the 52nd week of age,

TABLE 7.—*Efficiency of feed utilization for the breeds and crosses* * (*pounds of feed per one pound of eggs*)

AGE IN WEEKS	BREEDS AND CROSSES						
	Fay.	W.L.	R.I.R.	W.L. x F.	F. x W.L.	R.I.R. x F.	F. x R.I.R.
24–28	4.72	6.52	—	4.17	4.18	6.39	—
16/ 7–12/8							
28–32	4.10	5.42	—	3.32	3.56	4.23	4.53
13/ 8– 9/ 9							
32–36	13.52	7.66	—	11.40	8.29	7.14	5.96
10/ 9– 7/10							
36–40	8.67	7.81	11.13	8.09	8.41	6.41	9.37
8/10– 4/11							
40–44	6.77	5.14	4.59	4.48	4.88	5.16	5.26
5/11– 2/12							
44–48	5.42	5.76	5.11	5.45	5.48	5.01	5.37
3/12–30/12							
48–52	4.42	5.17	3.38	3.74	3.20	4.08	3.44
31/12–27/ 1							
52–56	4.71	4.86	3.49	3.48	3.30	3.76	3.87
28/ 1–24/ 2							
56–60	3.75	3.61	3.81	3.35	3.72	3.72	3.31
25/ 2–24/ 3							
60–64	4.08	3.34	4.00	3.70	3.98	4.05	3.66
25/ 3–21/ 4							
64–68	4.30	4.45	3.82	3.63	3.99	4.08	3.28
22/ 4–19/ 5							
Average	5.04	5.07	4.26	4.29	4.33	4.59	4.29

* Beginning from the nearest date to the average age at sexual maturity.

no obvious changes in feed efficiency were found. Considering the accumulative feed efficiency, it was clear that the lowest efficiency occurred at the 40th week, after which there was a gradual improvement for all the breeds and crosses (table 8). The accumulative values showed that the R.I.R. was the most efficient among the purebreds. The W.L. × F. and F. × R.I.R. pullets used fewer pounds of feed per pound of eggs than did F. × W.L. and R.I.R. × F. The pounds of feed utilized per dozen eggs produced during the period from sexual maturity till 68 weeks, was lowest for F. followed by R.I.R. and W.L. The W.L. × F. and F. × W.L. utilized approximately the same amount of feed per dozen eggs, lower than that of R.I.R. × F. and F. × R.I.R.

The present results indicate breed differences in the ability to convert feed into eggs. These may be due to differences in the ability to assimilate the various components of the ration which, in turn, may be due to differences in the comparative structure of the digestive system and/or to differences in the output of the digestive juices. The flora of the digestive canal may also account for such differences. Birds, Rubin, and Groschke (1947) differentiated groups of birds with inherited differences in withstanding deficiency of animal proteins in the ration. All of the crossbreds obviously showed intermediate or better ability to convert feed into eggs than their parents. Variations in the efficiency of feed utilization among the purebreds and crossbreds may lead to suggest that this character is inherited.

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TABLE 8.—*Accumulative feed efficiency for the breeds and crosses (pounds of feed utilized per one pound of eggs produced)*

BREEDS AND CROSSES	FROM SEXUAL MATURITY TO THE AGE OF: (weeks)										
	28	32	36	40	44	48	52	56	60	64	68
F.	4.72	4.37	5.86	6.42	6.50	6.28	5.91	5.70	5.33	5.14	5.04
W.L.	6.52	5.83	6.42	6.74	6.34	6.24	6.05	5.86	5.48	5.16	5.07
R.I.R.	—	—	—	11.13	6.42	5.92	4.97	4.56	4.40	4.33	4.26
W.I. × F.	4.17	3.68	4.97	5.52	5.26	5.30	4.99	4.71	4.48	4.37	4.29
F. × W.L.	4.18	3.82	4.76	5.37	5.26	5.30	4.84	4.55	4.43	4.37	4.33
R.I.R. × F.	6.39	5.05	5.65	5.84	5.67	5.55	5.26	4.97	4.75	4.65	4.59
F. × R.I.R.	—	4.53	5.18	6.09	5.85	5.75	5.16	4.91	4.60	4.45	4.29

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ABACA MARKETING PRACTICES IN COMPOSTELA, DAVAO [1]

CRISOGONO U. CAINTIC

The farmers surveyed in Compostela were all owner-operators. The average size of farm was 16.3 hectares, 40 per cent of which was planted to abaca. The gross income derived from abaca per farm was ₱4,009. After deducting the harvesters' share, fee for stripping apparatus, and farm maintenance, the farmer received a net of 35 per cent of the gross income or ₱1,391.

Tangongon and Bungolanon were the two common abaca varieties in Compostela.

Farmers with larger yield per harvest received higher returns by selling the fiber directly to exporters in Davao City. Exporters paid ₱4.42 more per picul than local buyers in Compostela. On the other hand, farmers with smaller harvest, often tied up with debts with local merchants, had no other choice of outlet but their creditors. Bulk sales without grading was common. The buyers quoted the price.

Big wholesalers handled 84 per cent of the volume sold. Sellers without accounts obtained higher prices for their fiber while those selling to settle financial obligations obtained less.

Transportation was one of the major problems in Compostela. The type of transportation used was influenced by the location of the farm. Farms near the road used trucks; those near the river used boats equipped with outboard motors; and farms accessible only by trails hired men carriers. Most of the farms lacked the first two means and the man carrier, although the most expensive type of transportation, comprised the means for 62 per cent of the volume sold.

About three million Filipinos depend on abaca (Manila hemp), the third leading export of the Philippines, for livelihood. However, problems beset the industry, the most pressing of which concern both production and marketing. The government in seeking ways to help elevate the standard of living of the small farmers, concentrate on the production phase. Little is it realized that increased production is not as meaningful in effecting the government's aim without efficient marketing of the farmer's produce.

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The small abaca grower is not exempted from this omission. In marketing his fiber, he is often at the mercy of middlemen, particularly of aliens who dictate the prices as a result of debts due them. Often, in the remote barrios, the farmer by the pressure of necessity sells his fiber to the local storeowners without much regard to price. These local merchants usually quote a lower buying price for abaca but charge a higher selling price for the prime commodities.

The farmer knows that as in the bringing in of essential commodities, marketing services must also be performed and paid for in moving his fiber to the point of last sale. However, he doubts whether the middlemen's margin for these marketing services are justifiable because with very high marketing margin, his own returns become very low.

There are various forces affecting the price paid to abaca producers. Although some of these are beyond his control, others are within his power, such as producing better quality fiber and minimizing debts that tend to lower his bargaining power.

Previous studies on marketing farm products in general have provided certain preliminary information on abaca marketing.

Quisumbing and Elayda (1926) stated that in Bicol, the abaca fiber was sold in the local market except when the producer had direct connections with exporters in Manila. In the market, the buyer determined the grades, as the producer had no knowledge about grades, and also quoted the price.

Asuncion (1923) said that farmers paid little attention to timing the marketing of their product to obtain maximum returns.

Quintana (1952) in his study of the economic and social conditions of abaca farmers in Baybay, Leyte, revealed that all the farmers used the native "hag-utan" with serrated knife for stripping. To minimize costs, farmers personally transported their fiber to the abaca merchants, usually carrying it on their heads.

Kearl *et al.* (1956) reported that consumers and farmers alike were interested in specific information that would serve as a basis for improving the present marketing system.

Darrah (1958) commented that "as long as the educational achievement of typical farmers is only about four years of schooling,

it will be extremely difficult to convince them that it is wise to adopt new and better methods of performing the maketing job."

The objects of this study are (1) to determine the marketing practices of abaca farmers, (2) to understand the methods of abaca marketing employed by successful producers in order to have a basis for improving the industry, (3) to determine problems in the marketing of this product such as preparing the product for the market, market outlets, price variations, methods of sale, and buyers' preferences, and (4) to make recommendations for the solution of the problems.

A list of abaca farmers was prepared for each barrio. This was made easy through the help of the barrio lieutenants and the B.P.I. fieldmen. The list included all abaca farmers with farms located and operated in Compostela. Records were taken by enumerating farms with abaca land of 2 hectares or more. The information was taken through personal interviews with the farmers.

THE SURVEY AREA

A survey of 120 abaca farmers was conducted in 26 barrios of Compostela, Davao from April to May, 1957. Of the 28 barrios in the municipality, two were not included since they had shifted to corn farming. These were the barrios heavily infested with abaca mosaic.

Compostela is about 90 kilometers north of Davao City. The western part of it lies along the Davao-Agusan National Highway. Its neighboring towns are Monkayo in the north and Tagum in the south. It is bounded in the east and west by mountain ranges extending north to south. The Agusan river meanders through the valley. The town has an area of about 110,000 hectares, 37,000 hectares of which are agricultural lands. Before the Liberation, this was inhabited by only a few natives, the Mandayas and Mansacas. Now it has a population of about 50,000 comprising mostly of settlers from Luzon, the Visayas, and some provinces in Mindanao.

Rain throughout the year and fertile soil favor the growth of abaca which is the major crop. The minor crops are corn, rice, coconuts, coffee, and cacao. Fruits and vegetables could also be grown well but because of their perishable nature, they are raised only for home consumption, especially by farmers in the remote

barrios. Of the farmers interviewed, neither those near the market nor those near the road raised fruits and vegetables in large scale, since these products were very cheap in the market.

THE FARMERS

Origin of the 120 abaca farmers. Most of the farmers surveyed were settlers. Seventy-six per cent were from the East Visayas, 11 per cent from Luzon, 6 per cent from the West Visayas, and 7 per cent from Mindanao itself. Previous experience perhaps influenced the type of farming settlers engaged in. Farmers from the East Visayas probably had experience in abaca farming while those from Luzon and the West Visayas had experience in rice and corn farming. Consequently, most of the abaca farmers surveyed were reportedly from the East Visayas whereas the rice and corn farmers were from Luzon and West Visayas. Very few of the natives of Mindanao cultivated two hectares or more for any crop. They still use the *caingin* system of farming.

Educational attainment was 4 years of schooling and farming experience averaged 31 years. The majority of the farmers surveyed were from 31 to 50 years old, with an average age of 43 years. Obviously, the older farmers had more farming experience than the younger ones. However, the younger farmers had had more years of education.

THE FARMS

The abaca farms were usually cleaned three times a year, before each harvest. They were weeded during sunny days and replanted during rainy days. Only the more prosperous farmers fertilized their fields and only one farm was planted with shade trees called *Ani-i.* This farm, compared with its neighbors, was much better in stand as well as in growth. All other factors being equal, farms along the river were more productive. These farms, however, suffered the most damage from floods. The average yield per farm was 103 piculs.

Land use. The average area of the farms was 16.3 hectares. Two thirds of the area could have been classified as abaca land had it not been for the attack of diseases, particularly abaca mosaic. Only 40 per cent of the farms was left planted to abaca (table 1), the rest being grown with corn, rice, coffee, cacao, and coconut. Compostela is still regarded as having extensive land use. The sur-

vey revealed that only 13 per cent of the area was untouched forest. Other abaca farms ruined by abaca mosaic could be put into the production of various crops which would substantially add to the farmer's income.

TABLE 1.—*Land use*

LAND USE	AVERAGE AREA	PER CENT OF FARM AREA
	Hectares	
Total	16.3	100
Abacá	6.6	40
Abanloned [a]	3.5	21
Other crops	2.4	15
Wood land	2.2	13
Orchard	1.2	8
Farmstead	0.3	2
Others [b]	0.1	1

[a] Ruinel abacá land.
[b] Passed through by roads, cemetery, swamps, etc.

Percentage of sharing of production. The average gross sale of the farmer from abaca was ₱4,009. Twenty-nine per cent of it went as share to the harvesters, 24 per cent to the stripping apparatus (table 2). The net to the operator was 35 per cent or ₱1,391. Except for a few who produced food crops and some other money crops, the abaca farmer generally depended on abaca almost entirely for subsistence.

TABLE 2.—*Percentage sharing of abacá production*

ITEMS	PESOS PER FARM	PESOS PER HECTARE	PER CENT
Total	4,009	663	100
Machine stripping	494	82	12
Production expense [a]	976	161	24
Harvester's share	1,148	190	29
Net to operator	1,391	230	35

[a] Weeding, replanting, spraying.

MARKETING PRACTICES

Pre-sale practices

The harvestable abaca stalks were felled with a tumbling knife after the leaves and fruits had been cut off. Tumbled stalks were

piled into *bontons* of about 5 to 12 stalks. One bonton makes a *balotan* of tuxies which are grouped according to the layers of leaf sheaths they came from.

Balotans were carried to the stripping shed on men's shoulders, on carabaos' backs, or on sleds. The stripper sorted the fibers according to the kind of tuxy. All stripping in Compostela was mechanized.

After drying, which normally took place from early morning until about five o'clock in the afternoon, the fibers were tied into separate bundles and stored. Temporary storage was usually provided for by *bodegas* set up in the stripping sheds except for a few farmers who stored their fibers in their houses. Baling of the fiber was done by four to five persons, just before marketing. The size of the bales depended on the distance from the market and on the strength of the haulers.

The farmers surveyed generally sold their fiber immediately after harvest.

Transportation

Transportation is one factor closely linked to marketing. Adequate and improved means of transportation would spur up marketing activities and help boost the economy of Compostela. But, as in most Philippine communities, this remains one of the town's present problems.

Method of transportation. In developing areas, it is interesting to note the struggle of the modern against the old. In the survey area (table 3), the few modern modes of transportation are

TABLE 3.—*Percentage of sales and volume transported by method of transportation*

	PER CENT OF FARMERS REPORTING	PER CENT OF PICULS TRANSPORTED [a]
Total	100	100
Man carrier	61	62
Boat with outboard motor	12	16
Man and truck [b]	15	13
Truck	10	7
Animal-drawn vehicle	2	2

[a] 12,357 piculs.
[b] Man covered not less than ½ kilometer.

still outnumbered by primitive types. Hired men carriers were the most important means of transporting the abaca from the farm to the market, both in terms of number of sales and piculs marketed.

Means of transportation were highly influenced by the location. Men carriers were employed in places where other means of transportation could not be obtained. Farms near the navigable rivers made use of boats equipped with outboard motors. Farms closer to the highways had their abaca transported by trucks, by a combination of men carriers and trucks, and by carabao-drawn carts.

Distance covered and cost of transportation. Farms varied in distance to buyers, ranging from a few meters to more than one hundred kilometers. The average distance was eight kilometers. This included five farms whose fiber was sold directly to exporters located in Davao City, a distance of about 111 kilometers. Boats with outboard motors covered the greatest distance, 33 kilometers; animal-drawn vehicles covered the shortest distance, two kilometers (table 4).

TABLE 4.—*Distance travelled and transportation cost by method of transportation*

METHOD OF TRANSPORTATION	AVERAGE DISTANCE TRAVELLED	COST PER PICUL PER KILOMETER	COST PER PICUL
	Kilometer	*Pesos*	
All methods	8	0.22	1.90
Man carrier	5	0.48	2.43
Boat with outboard motor	33	0.11	3.24
Man and truck	5	0.20	.63
Animal-drawn vehicle	2	0.22	.50

Cost per picul per kilometer was computed by dividing the total cost of each means of transportation by the total distance. Efficient methods of transportation carried the produce to the market not only faster but also at a lower cost. The average transportation cost for all method was ₱0.22. It cost only ₱0.09 per picul per kilometer by using a truck, while the rate for a man carrier was ₱0.48. Transportation expenses were usually shouldered by the harvesters. However, a few buyers paid for transportation or offered free trucking by picking up the fiber from the roadside to the store. This was usually the premium to harvesters who produced high-quality fiber.

The cost of transportation by boat with outboard motor, only ₱0.11 per picul per kilometer, was also much lower than by man carrier; however, owing to the distance the boat had to cover, the cost of bringing a picul of abaca to the market amounted to ₱3.24. This was ₱0.81 more than the cost of having it carried by men.

Cost of man transportation. Transportation cost per picul increased with distance from the market (table 5). Farms three kilometers or less from the market paid ₱0.81 per picul, while farms 12.1 kilometers and farther paid ₱4.34. However, cost per picul per kilometer decreased as distance increased, and less than one third of the farmers using man transportation were affected. Most of the farmers spent ₱2.57 or less to ship a picul of fiber to the market.

TABLE 5.—*Relation of cost of man transportation to distance covered*

DISTANCE	FARMERS REPORTING	COST PER PICUL	COST PER PICUL PER KILOMETER
Kilometer		*Pesos*	
Total	66	—	—
3 or less	26	0.81	0.51
3.1–6	19	2.57	0.54
6.1–9	6	3.47	0.42
9.1–12	9	4.17	0.36
12.1 and above	6	4.34	0.30

Market Outlets

Volume, number, and size of sale. The first two types of market outlets were the two kinds of local buyers on the farm level. The big wholesalers, so called because they bought in larger volumes, were generally located either in the *poblacion* or along highways. The other buyers, who were generally closer to the farms, had limited capital and bought in small quantities. They sold their stock to the big wholesalers, who in turn sold to exporters in Davao City, the third type of market outlet.

The big wholesalers represented the most important outlet. They were reported in 86 per cent of the total number of sales, obtaining 84 per cent of the total piculs sold (table 6). Small wholesalers and exporters were relatively less significant outlets, as shown by both number and volume of sale.

TABLE 6.—*Volume, number, and size of sale by type of buyer*

TYPE OF BUYER	PERCENTAGE OF SALE [a]	PERCENTAGE OF VOLUME [b]	PICULS PER SALE
All buyers	100	100	34
Big wholesaler [c]	86	84	33
Small wholesaler [d]	8	12	27
Exporter	6	4	56

[a] 363 sales.
[b] 12,357 piculs.
[c] Buyers who later sold to exporters.
[d] Buyers who later sold to big wholesalers.

For all types of buyers, the average sale amounted to 34 piculs. It should be observed that whereas exporters have been mentioned as third ranking market outlet, their individual purchases were largest. Usually they were the customers for farmers with much produce to sell. Farmers with smaller yields did not particularly bother to look farther; they disposed their fiber to the nearest buyer regardless of price.

Nationality of buyer. Sixty-four per cent of the buyers were aliens (table 7) who were largely the big wholesalers; the Filipinos were more among the small wholesalers. Exporter-buyers were in the form of corporations of mixed nationalities.

TABLE 7.—*Nationalities by type of buyer (per cent)*

NATIONALITY	WHOLESALER		EXPORTER	ALL BUYERS
	Big	Small		
Total	85	11	4	100
Aliens	62	2	—	64
Filipino	23	9	—	32
Corporations	—	—	4	4

Reasons for choosing outlets. Farmers had several reasons for their selections of buyers. The most important was to choose buyers who could extend them credit. Two other important reasons were the proximity of the buyer and the better price they could get for their product.

Abaca farms in Compostela were almost all homestead lots and were still without titles which prevented their borrowing from banks. Their only source of credit was the local buyers. The farmers were

aware of the great disadvantage of this type of credit, but because of their lack of cash and because of their pressing need for prime commodities, they were forced to take credit at whatever rate of interest. The merchant doubly reduced the farmer's income by raising the price for goods taken on account and bringing down the price of the fiber sold to settle financial obligations.

Method of payment by type of buyer. Big wholesalers gave the greatest number of mixed payments. Part of the product collected for the farmer's account and the balance was paid for in cash. Small wholesalers and exporters alike generally paid cash on delivery (table 8).

TABLE 8.—*Method of payment by type of buyer (per cent of volume sold)*

METHOD OF PAYMENT	ALL BUYERS	WHOLESALER		EXPORTER
		Big	Small	
Total	100	100	100	100
Cash on delivery	35	28	58	88
Paid in advance	2	1	—	12
Payment for account	3	3	—	—
Mixed [a]	60	68	42	—

[a] Cash on delivery and payment for account.

Variety

Description of varieties. There are three known commercial varieties of abaca in Davao, namely, Tangongon, Bungolanon, and Magindanao. Tangongon, a light suckering variety, has long and big purplish stalks. Being shallow-rooted, it cannot stand well in light soil when exposed to strong wind. However, it has the highest resistance to various abaca diseases. Bungolanon, on the contrary, is heavy suckering. Its stalks are black, generally smaller than those of Tangongon or Magindanao. Its resistance to abaca diseases is intermediate between the other 2 varieties, Magindanao being the most susceptible. Almost in all respects except in its fineness of texture and yellowish color of stalks, Magindanao is closely similar to Tangongon. Being highly susceptible to abaca diseases, it went out of commercial importance. Normally, Tangongon and Bungolanon give the same yield per hectare. These two varieties, however, vary with the type of soil. Clayey soil favors Tangongon while sandy loam favors Bungolanon.

Volume marketed. Forty-seven per cent of the fiber sold was a mixture of Tangongon and Bungolanon. Pure Tangongon comprised 38 per cent and pure Bungolanon, 14 per cent.

In the beginning, the farmers made no particular choice for planting. Almost all varieties available served as planting material. They developed preferences later, after finding out the characteristics of each. For instance, many farmers replanted their Bungolanon farms with Tangongon.

Volume of each variety bought by types of buyer. Buyers generally bought regardless of variety. Distribution of volume of each variety to types of buyer was incidental. Big wholesalers, however, received more mixed varieties (table 9).

TABLE 9.—*Volume of each variety bought by type of buyer (in piculs)*

VARIETY	ALL BUYERS	WHOLESALER		EXPORTER
		Big	Small	
Tangongon	4,765	4,678	87	—
Bungolanon	1,695	1,043	178	474
Mixed	5,897	4,645	491	761

No pure Tangongon was directly brought to exporters. The buyer in Compostela, bought not for local consumption but for the exporters. Exporters, however, did not sell all their purchases abroad; a small portion was used for local manufacture and consumption.

Monthly sale by variety. Although each variety had its own peak month of sale (table 10), variation in sale was very slight.

The relatively higher sale in March coincided with the time when the laborers went home to their towns. The farmer had to sell more to be able to pay these laborers. As a consequence, his April sale dropped.

Prices

Sources of price information. Farmers differed much in source of price information. More than half of them depended on the buyers' price quotations, about one third got their information from their neighbors, and only a few resorted to newspapers or radio price broadcasts.

TABLE 10.—*Monthly sale by variety*

MONTH	ALL VARIETIES	TANGONGON [a]	BUNGOLANON [b]	MIXED [c]
		Per cent of total piculs		
Total	100	100	100	100
April 1956	6	2	18	7
May	7	7	7	6
June	9	10	10	10
July	9	14	7	10
August	6	7	10	4
September	8	7	3	9
October	8	6	9	10
November	10	16	5	7
December	9	6	13	10
January 1957	8	4	8	9
February	8	7	5	7
March	12	14	5	11

[a] 4,811 piculs.
[b] 1,695 piculs.
[c] 5,851 piculs.

Monthly prices by variety. Prices, in general, for the period studied were steady from May to July, particularly with respect to the Tangongon variety (table 11). Starting with this period, the average price gradually increased from ₱34.00 in July, 1956, to ₱46.00 in February, 1957. The only exception to this tendency was

TABLE 11.—*Monthly prices by variety*

MONTH	ALL VARIETIES	TANGONGON	BUNGOLANON	MIXED
		Pesos per picul		
All months	38	39	37	39
April, 1956	36	36	37	36
May	34	34	33	35
June	34	34	34	34
July	34	34	35	35
August	35	36	33	36
September	36	36	36	38
October	39	40	38	39
November	39	40	38	39
December	42	42	42	43
January, 1957	44	45	40	44
February	46	46	44	46
March	44	44	42	44

Bungolanon, which dipped by ₱2.00 from December, but recovered by ₱4.00 in February.

Varietal prices did not vary widely for any given month. Peak prices for all varieties were attained in February.

Price for each variety by local buyers. Both big and small wholesalers paid about ₱38.00 per picul for all varieties. On the average, Tangongon and mixed varieties had higher prices than Bungolanon. Small wholesalers, however, paid more than big wholesalers for Bungolanon (table 12). Big wholesalers, on the other hand, paid more for the mixed.

TABLE 12.—*Average price for each variety by type of buyer*

TYPE OF BUYERS [a]	ALL VARIETIES	TANGONGON	BUNGOLANON	MIXED
		Pesos per picul		
Big wholesaler	38.34	38.68	36.37	38.56
Small wholesaler	37.95	35.24 [b]	37.02	38.77
All buyers	38.29	38.52	38.50	38.59

[a] Exporters not included.
[b] Only two cases.

Differences in price paid by different buyers might have been affected by such factors as time and quality. Perhaps small wholesalers bought good quality Bungolanon or bought when prices were high for all varieties. The same might be true with the big wholesalers' buying of Tangongon.

Prices for each variety by method of payment. Considering all varieties, higher prices were paid in cash on delivery. This is expected because the sellers had the chance to select the buyer offering the best price. In contrast, farmers in debt had to sell their fiber to their creditors despite the low price quoted by the creditors. This accounts for the lower price under mixed payment (table 13).

TABLE 13.—*Price for each variety by method of payment*

METHOD OF PAYMENT [a]	ALL VARIETIES	TANGONGON	BUNGOLANON	MIXED
		Pesos per picul		
Cash on delivery	39	38	37	39
Mixed	38	39	36	38
All methods	38	39	36	39

[a] Advanced payment (two cases) not included.

Mixed payment (cash on delivery and payment for account) was higher for Tangongon but lower for both Bungolanon and mixed varieties. On the whole, however, Tangongon and mixed varieties obtained higher prices.

Average price per picul by method of payment given by local buyers. Generally, prices in cash-on-delivery sales were ₱1.00 higher than in the mixed method of payment (table 14). This was the case particularly among big wholesalers. Small wholesalers paid the same prices by either method of payment. Obviously, under the mixed method of payment that involved some kind of credit extension, the farmer assumed a lower bargaining power.

TABLE 14.—*Price in pesos per picul by method of payment given by type of buyer*

METHOD OF PAYMENT	ALL BUYERS	WHOLESALER	
		Big	Small
Cash on delivery	39	39	38
Mixed	38	38	38
All methods	38	38	38

Price differential between exporters and local buyers. The exporter paid ₱42.71 per picul at Davao City. This was the net price after deducting ₱1.00 per picul for transportation from Compostela to Davao City. Wholesalers' price at Compostela averaged ₱38.29 per picul or ₱4.42 less.

In spite of the better price that exporters offered, the farmers, especially those with small production, felt it inconvenient to sell small volumes of fiber in Davao City. Furthermore, as stated earlier, they were not free to select other outlets while still bound with debts to their creditors.

MARKET PROBLEMS

1. Despite low prices prevailing in the market, the farmer had to harvest his crop to avoid much loss from overmaturity.

2. Selling the product was an individual affair. Marketing was done immediately after harvest not only because storing was a problem but because the farmer needed cash immediately.

3. The only sources of credit were the merchants. As a general practice, such private individuals charge the highest interest rate.

4. Transportation of the fiber to the market remains one of the greatest problems.

5. Lack of quality standardization of fiber on the farm level offered buyers an opportunity to quote the price.

RECOMMENDATIONS

A few measures are recommended to help solve these problems:

1. Improvement of transportation facilities to move the product from the farm to the market faster at relatively smaller cost;

2. Organization of FaCoMas (a) to handle the marketing of the members' products, (b) to procure commodities needed by the members, and (c) to act as lending agencies;

3. Finding some new uses of abaca to increase demand and maintain its market.

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NOTE: A CASE OF TWO OVIDUCTS IN THE CHICKEN

The adult female of *Gallus domesticus* normally has a single functional ovary and oviduct situated to the left of the median line of the body. Deviations from this were occasionally observed and reported. The presence of a right oviduct although non-functional and not as fully developed as the left oviduct is of unusual interest. One of the recent reports was that of Champion (1955),[1] a case of a crossbred pullet having a right oviduct in addition to the normal left oviduct. He cited other reports of anatomical peculiarities involving the reproductive tract of the female fowl like cases of two ovaries and paired oviducts.

On October 14, 1959, an adult female crossbred pullet from the poultry flock of the College of Agriculture, University of the Philippines, was accidentally found to have a right oviduct in addition to the normal left oviduct. This pullet was about seven months old and a third generation product of crisscrossing the Single Comb White Leghorn and the New Hampshire. No individual records of egg production was available but it was evident that this pullet was actively laying as indicated by the internal characteristics. A fully formed egg was found in the uterus of the functional oviduct during post-mortem examination.

As shown in figure 1, this female had a functional left ovary (there was no visible evidence of a right one), a left oviduct and a well developed right oviduct. The left oviduct had a total length of 52 cm. from the orifice to the vent while the right oviduct measured 23 cm. In the report of Champion (1955), the left oviduct had a total length of 60 cm. and the right oviduct was 41.5 cm. The right oviduct in his report was considered exceedingly long as compared to previous reports. Quinn *et al* (1939)[2] described "the fully developed" right oviduct as being 25 cm. long. The present case report is comparable to other reports mentioned by Champion.

Elpidio C. Coligado

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[1] Lloyd R. Champion, *Poultry Sci.*, **34**, 184-186 (1955).
[2] J. P. Quinn, W. H. Burrows, & E. H. McNally, *Poultry Sci.*, **18**, 381-384 (1939).

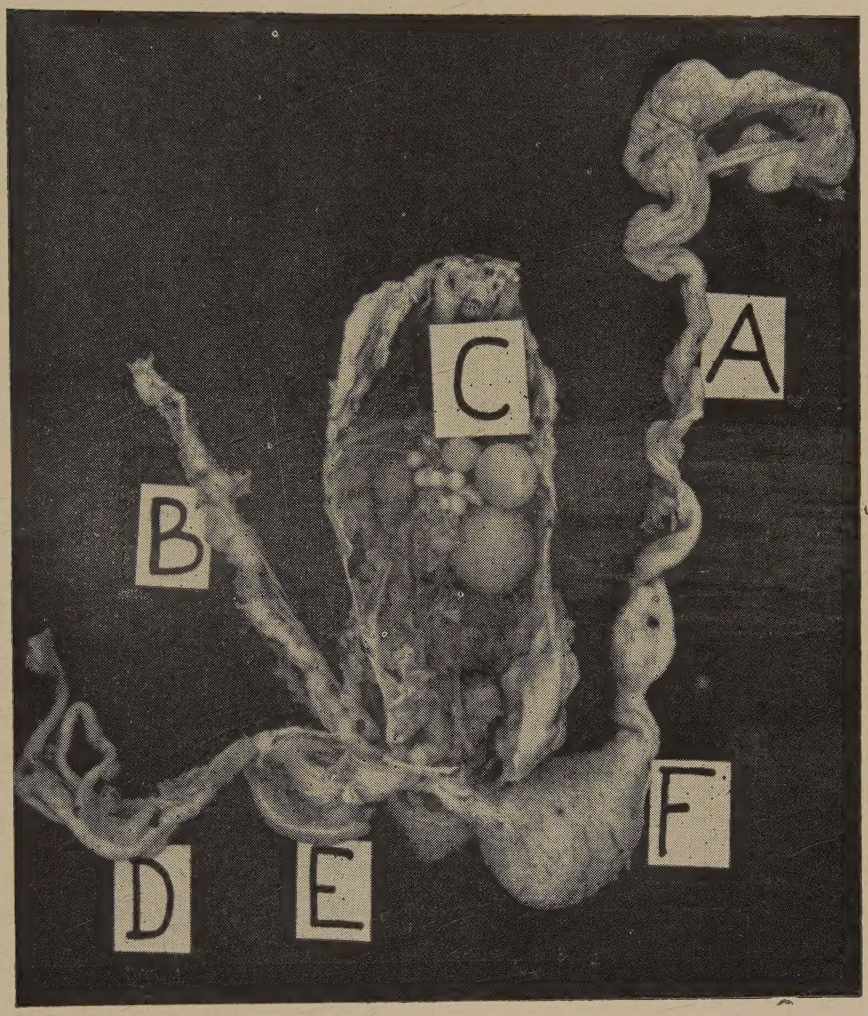
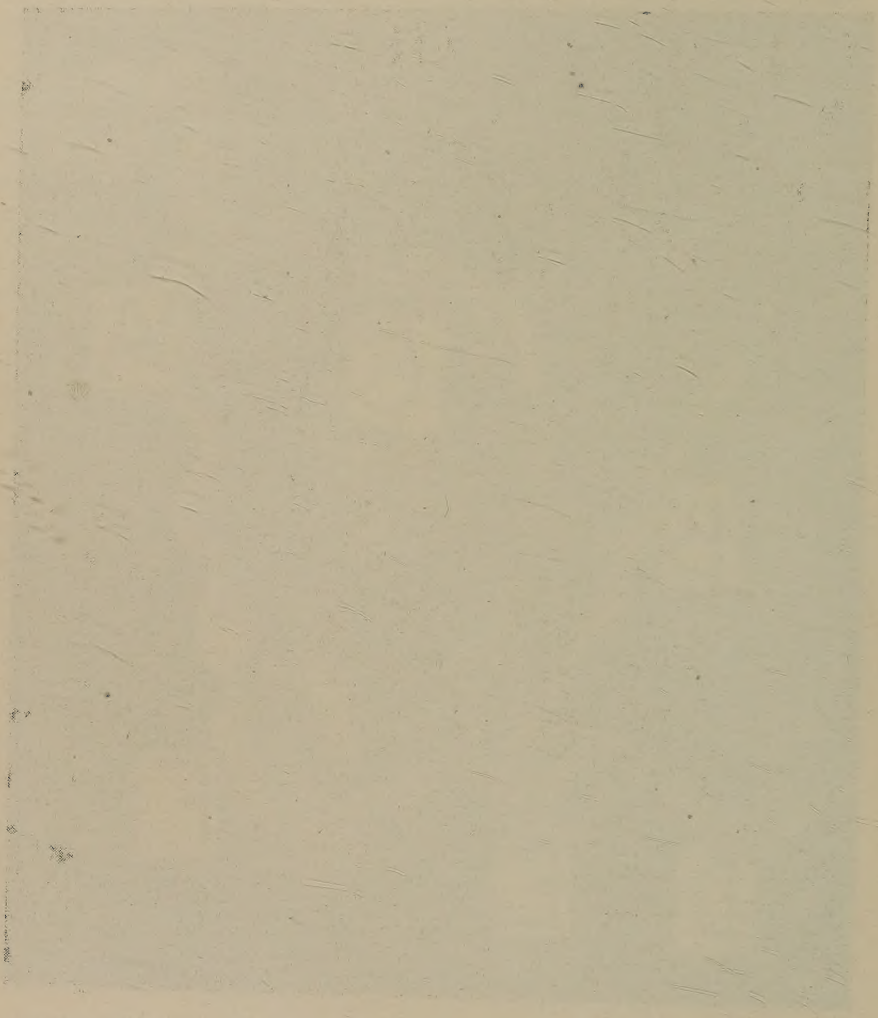


Fig. 1.—Parts of the body organs of a female chicken showing (B) a developed right oviduct in addition to (A) the functional left oviduct. (C)—left ovary; (D)—part of the digestive tract; (E)—anus; and (F)—a fully formed egg in the uterus.



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